

IN THE UNITED  
STATES PATENT AND TRADEMARK OFFICE BEFORE THE  
BOARD OF  
PATENT APPEALS AND INTERFERENCES

Art Unit: 1794 (Examiner: Gray, Jill M.)  
Applicant/Appellant: VENKAT K. RAGHAVENDRAN  
Serial No: 10/696,869  
Filed: October 30, 2003  
Confirmation No. 9106  
Title: IMPROVED GLASS MAT THERMOPLASTIC  
COMPOSITE  
Attorney Docket No.: 3813

Mail Stop: Appeal Brief - Patents  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

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**APPEAL BRIEF**

Dear Sir:

Appellant appeals from the rejection dated March 11, 2008 in which Claims 1-14, 26, 29-32, 34, 35 and 38-54 were rejected. The Notice of Appeal and the filing of this Brief along with all associated fees is presented simultaneously herewith.

**Real Party In Interest**

This application is assigned to Azdel, Inc.

**Related Appeals and Interferences**

None.

**Status of Claims**

Pending: Claims 1-14, 26, 29-32, 34, 35 and 38-54  
Rejected: Claims 1-14, 26, 29-32, 34, 35 and 38-54  
Canceled: Claims 15-25, 27, 28, 33, 36 and 37  
Objected to: None  
Withdrawn: None  
Appealed: Claims 1-14, 26, 29-32, 34, 35 and 38-54

**Status of Amendments**

No amendment to the claims or specification was filed after the Office Action of March 11, 2008.

**Summary of Claimed Subject Matter**

a) **Claim 1**

A composition of a fiber reinforced laminate material	Page 3, under "Summary of the Invention", lines 1-2
for a compression molding or thermoforming process	Page 3, under "Summary of the Invention", line 3
said composition of the laminate material comprising: a) a layer comprised of a thermoplastic resin	Page 3, under "Summary of the Invention", lines 6, 7; Fig. 1, Ref. #12
a layer of a polymerizable component	Page 3, "Summary of the Invention", line 7; Fig. 1, Ref. #14
macrocyclic oligoester	Page 7, "Summary of the Invention", line 16; page 9, lines 1-8
having a melt temperature	Page 5, "Summary of the Invention", lines

	9-10; page 8, line 8, page 10, line 6
wherein on a weight basis the polycarbonate is greater than 50% of a total weight of the polymerizable component layer	Page 10, "Summary of the Invention", lines 6-18
a layer of reinforcing fibers	Page 3, "Summary of the Invention", line 8
that are permeable by the thermoplastic resin and the polymerizable component	Page 5, "Summary of the Invention, lines 5-10; page 8, lines 5-9
at the melt temperature of the polymerizable component	Page 5, "Summary of the Invention", lines 14-16
said thermoplastic resin, polymerizable component and reinforcing fibers layers fusing and reacting forming a composite having a surface	Page 8, "Summary of the Invention", lines 7-13; Page 1 under "Field of the Invention", lines 1-4
that is substantially fiber free	Page 5, line 21
and has a polymerized macrocyclic oligoester thereon	Page 5, line 24; page 9, lines 7-10

**b) Claim 43**

A composition of a fiber reinforced laminate material	Page 3, under "Summary of the Invention", lines 1-2
for a compression molding or thermoforming process	Page 3, under "Summary of the Invention", line 3
said composition of the laminate material comprising:	Page 8, "Summary of the Invention", lines 17-22; page 8, line 21
a) an upper overlayer comprised of a thermoplastic resin and a polymerization agent;	
b) a upper layer of reinforcing fibers	Page 8, "Summary of the Invention", lines 3-4
c) a core layer comprised of a polymerizable component	Page 8, "Summary of the Invention", line 4
comprised of chemically reactive components	Page 9, "Summary of the Invention", lines 8-10
d) a lower layer of reinforcing fibers	Page 8, "Summary of the Invention", lines 3-4
e) a lower overlayer comprised of a thermoplastic resin	Page 8, "Summary of the Invention", lines 4-5
wherein the layers of reinforcing fibers are	Page 5, "Summary of the Invention", lines

permeable by the thermoplastic resin and the polymerizable component, when the laminate material is under heat and compression	5-7
and, wherein upon attaining a melt temperature in a mold, the polymerizable component has a lower viscosity than the thermoplastic resin	Page 5, "Summary of the Invention", lines 7-9
and under compression the layers fuse forming a composite having a substantially fiber free surface	Page 5, "Summary of the Invention", lines 9-10; line 21
rich in the polymerizable component, where the polymerizable component polymerizes during formation of the composite	Page 8, "Summary of the Invention", lines 13-14

## c) Claim 47

A composition of a fiber reinforced laminate material	Page 3, under "Summary of the Invention", lines 1-2
for a compression molding or thermoforming process	Page 3, under "Summary of the Invention", line 3
said composition of the laminate material comprising:	Page 8, lines 17-22
a) an upper overlayer comprised of a thermoplastic resin	
b) a upper layer of reinforcing fibers	Page 8, lines 3-4
c) a core layer of a polymerizable component	Page 8, line 4
comprised of a macrocyclic oligoester	Page 8, lines 7-8
having a melt temperature	Page 10, lines 5-7
d) a lower layer of reinforcing fibers	Page 8, lines 3-4
where the upper and lower layers of reinforcing fibers are permeable by the thermoplastic resin	Page 5, lines 5-7
and the polymerizable component at the melt temperature of the macrocyclic oligoester	Page 5, lines 14-16; lines 21-24
and,	
e) a lower overlayer comprised of a thermoplastic resin;	Page 8, lines 17-22

where said thermoplastic resin, polymerizable component and reinforcing fibers layers fuse and react at the melt temperature forming a composite that has a substantially fiber free surface rich	Page 5, line 21
in polymerized macrocyclic oligoester	Page 5, line 24; page 9, lines 7-10

### Grounds of Rejection to be Reviewed on Appeal

- Claims 1-14, 26, 29-32, 34, 35 and 38-54 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Kim (US Patent 4,983,247) in view of Winckler et al (US Patent 6,369,157).
- Claims 43-54 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Minnick et al (US Patent 5,175,198) in view of Winckler et al (US Patent 6,369,157) as applied above to Claims 1-14, 26, 29-32, 34, 35 and 38-54.

### Argument

#### Claims 1-14, 276, 29-32, 34, 35 and 38-54 rejected under 35 U.S.C. 103 (a) as being unpatentable over Kim (US Patent 4,983,247) in view of Winckler et al (US Patent 6,369,157)

- a) Claims 1-14, 26, 29-32, 34, 35, and 38-54 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Kim 4,983,247 in view of Winckler et al 6,369,157. Kim teaches a composite fiber reinforced sheet. As illustrated in Figure 1 the component 10 comprises a thermoplastic formed sheet having a resin-rich layer 12 forming surface 14 and a fiber filled thermoplastic body 16. As set forth in column 3, lines 30-35, the polymer matrix may be a variety of polymers, none of which are macrocyclic polyester oligomer based polymers. The teachings of Kim are also set forth on page 2 of Appellant's Specification. Kim does not teach a "polymerizable component comprised of a macrocyclic oligomer".

The importance of a polymerizable component comprised of a macrocyclic oligomer is found on page 5, lines 5-10 of Appellant's Specification. In particular, it is noted that the reinforcing fiber layer is permeated by the chemically reactive components (see page 4, lines 14-15 wherein it states that the polymerizable component contains chemically reactive compounds including macrocyclic oligomers). It is noted that when heat and compression is applied the polymerizable layer has a lower viscosity than the thermoplastic layer at elevated temperatures. This lower viscosity allows the polymerizable layer to permeate the reinforced fiber layer such that there are no gaps within the reinforced fiber layer that sometimes happens when you have the reinforced fiber layer and a thermoplastic resin layer such as that taught by Kim. Furthermore, the polymerizable layer has the lower viscosity and permeates the fiber layer quicker because it flows faster than the thermoplastic resin layer. Thus, there is a manufacturing efficiency achieved with the present invention.

Further, Kim has two disadvantages compared to the present invention, namely: 1) the thermoplastic resin slowly impregnates any fiber layer creating the possibility that it does not completely flow in and around and through the entire cross-section of the fiber layer; and 2) the thermoplastic resin layer is much slower to melt and has a higher viscosity and therefore flows much more slowly than a macrocyclic polyester oligomer layer and thus the process of Kim is much slower.

The summary of the present invention clearly states that Appellant's specification is directed to both a method and a composition. However, the claims in this application are directed only to a composition in which macrocyclic oligomer esters are employed.

To overcome the deficiencies of Kim, the Examiner relies on Winckler et al. In column 1 of Winckler et al, it is stated that linear polyesters are known and furthermore it is known that they may be fabricated into articles of manufacture by a number of known techniques including compression molding (see column 1, lines 22-31). Winckler et al recognizes that macrocyclic polyester oligomers exhibit low melt viscosity, allowing them to impregnate a dense fibrous preform easily (see column 1, lines 35-38). More

specifically, Winckler points out in lines 39-45 that certain macrocyclic polyester oligomers melt and polymerize at temperatures well below the melting point of the resulting polymer. Thus, it is not necessary to heat compression mold to the melting point of the polymer since the macrocyclic polyester oligomer can melt and polymerize at a temperature well below the melting point of the polymer. As a result, Winckler et al recognizes that the time and expense required to thermally cycle a tool is favorably reduced. Winckler et al also recognizes that the macrocyclic polyester oligomer material melts at a lower temperature than the resulting polymer and when it reacts with the polymerizing agent (polymerization catalyst), it solidifies fairly rapidly into a polyester polymer because the temperature is below the melt temperature of the polyester polymer. Thus, you can melt the blend of the macrocyclic polyester oligomer and catalyst at a temperature significantly below the temperature of a polyester resin, but as soon as the components react, the polyester polymer solidifies because it is below the melt temperature. Winckler et al states atop column 3 that prior to their invention, it was not recognized that a mixture of macrocyclic polyester oligomer and a polymerization catalyst can be stable and have a long shelf life and allow for easy production, storage, transportation and processing. Thus, Winckler uses no thermoplastic polyester sheet, unlike Kim, but instead uses 100% macrocyclic polyester oligomer to make thermoplastic resin reinforced fiber composite. Simply stated, Winckler et al teaches replacing the thermoplastic sheet with macrocyclic polyester oligomer and catalyst blend. Accordingly, the combination of Kim in view of Winckler et al would tell one skilled in the art to replace the thermoplastic resin-rich layer 12, for example, of Kim with the macrocyclic polyester oligomer/catalyst component of Winckler et al. It does not teach one skilled in the art to use both the thermoplastic resin layer and a macrocyclic oligomer layer, particularly when the macrocyclic oligomer layer also comprises polycarbonate, for example as set forth in Claim 1.

One skilled in the art, if combining Kim and Winckler et al, would replace the thermoplastic resin of Kim with the blend of the macrocyclic polyester oligomer and catalyst taught by Winckler et al. There is nothing in these references to suggest that you would add polycarbonate to the polymerizable component having the macrocyclic

oligomer (as claimed in Claim 1). Furthermore, there is nothing to suggest that you would replace or combine the macrocyclic polyester oligomer and catalyst blend with a thermoplastic resin taught by Kim. If that were done, there would be no benefit to using Winckler's macrocyclic polyester oligomer blend with a catalyst. Simply put, there is no reason to combine Kim and Winckler et al unless one skilled in the art first saw Appellant's invention. It is simply hindsight reconstruction.

b) Separate Argument for Claims 43 and 47

A separate argument is being made with respect to Claims 43 and 47. These claims call for a five-layer composite. Claim 43 calls for the thermoplastic resin layer and a polymerization agent (read catalyst) in the upper layer. A second upper layer of reinforcing fibers, a core layer of the macrocyclic polyester oligomer (the chemically reactive components) followed by another layer of reinforcing fibers, and followed lastly by another thermoplastic resin layer (this layer has no polymerization agent therein). Thus, when both the core and the thermoplastic resin have melted, the polymerization agent in the upper layer will then mix with the chemically reactive components (the macrocyclic polyester oligomer layer) thus causing it to polymerize quickly. It is not taught by Kim in view of Winckler to have an upper layer comprised of both a thermoplastic resin and the catalyst (polymerization agent). Neither Kim nor Winckler nor the combination thereof, teach a five-layer composite. Neither of these teaches a core having the polymerizable component comprised of the chemically reactive component. Neither of these teaches a double layer of reinforcing fibers and two outer layers of thermoplastic resin. The Examiner simply states that repeating layers of a composite is obvious. It may be obvious if the layers were merely repeated, but this is not what is claimed in Claim 43. As stated previously, for example, Claim 43 comprises in the upper most layer a thermoplastic resin and a polymerization agent.

c) Separate Argument for Claim 47

Many of the arguments made with respect to Claim 43 can be made here. Kim in view of Winckler et al do not teach one skilled in the art to have a five-layer composite wherein the core layer is a polymerizable component of macrocyclic oligoester. It does not teach one skilled in the art to have two layers of reinforcing fiber and two outer layers of thermoplastic resin.

**Claims 43-54 rejected under 35 U.S.C. 103 (a) as being unpatentable over Minnick et al (US Patent 5,175,198 in view of Winckler et al (US Patent 6,369,157)**

The Examiner states that Minnick teaches composites having fiber reinforcements and matrixes comprising 2 – 4 sheets of woven glass cloth between sheets of flame-retardant polycarbonate film with a core layer of non-flame-retardant thermoplastic. The Examiner states “as to the core layer being a polymerizable component comprised of chemically reactive compounds or a polymerizable component comprises of a macrocyclic oligoester, it would have been obvious to modify the teachings of Minnick by using a blend of polycarbonate and a macrocyclic polyester oligomer blend with a polymerization catalyst as taught by Winckler, motivated by the ability to reduce processing time and energy consumption during the molding process because said macrocyclic polyester oligomers have favorable crystallization rates.

What is unclear from this rejection is the fact that the core of the laminates discussed in Examples 1, 2 and 3 are a knitted woven glass cloth which is surrounded by a flame-retardant polycarbonate on each side. In Example 4, a non-flame-retardant polycarbonate film is used to provide the matrix in the core. With this example being the only example of a core comprising a polycarbonate film, rather than the knitted woven glass cloth, it is presumed the Examiner is focusing on Example 4. Example 4 is not mentioned in the rejection of the Examiner. In the rejection, the Examiner notes that a blend of polycarbonate and other resins is within the scope of Minnick et al (see column 5, lines 30-42). It is noted that these resins are blended with the polycarbonate wherein the resins are in very small amounts. What is meant by small amounts is unclear. It is

noted that none of the examples disclose anything other than polycarbonate or polyetherimide.

The Examiner believes that it would be obvious to those skilled in the art to modify the teachings of Minnick by using a blend of polycarbonate and macrocyclic polyester oligomer blended with the polymerization catalyst as taught by Winckler. The key to the Examiner's combination is that one skilled in the art would be motivated by the ability to reduce processing time and energy consumption during the molding process because of macrocyclic polyester oligomers have favorable crystallization rates. The Examiner has not provided an adequate reason for one skilled in the art to make this substitution because the Examiner's reason is faulty. Winckler teaches one to replace polyester with a macrocyclic polyester oligomer and a polymerization catalyst. That substitution has favorable crystallization rates and more importantly has lower temperature requirements. Having a blend of polycarbonate and the macrocyclic polyester oligomer blended with the polymerization catalyst is only as fast as the fastest crystallization rate component. The Examiner has offered one skilled in the art no information about the polymerization rates of polycarbonate under the conditions taught by Minnick et al nor has the Examiner shown that the polymerization of a blend of the polycarbonate and macrocyclic polyester oligomer actually produces favorable crystallization rates or lower melt temperatures. In fact, column 5, lines 36-37 state that any of the polyester resins are used in small amounts with the polycarbonate. Where are the favorable crystallization rates and the favorable temperatures when small amounts are used? Where is the proof that polycarbonate is a faster crystallization rate than polyester? Where is there any motivation to replace the polyester that may be blended with the polycarbonate with a macrocyclic polyester oligomer and polymerization catalyst? Certainly Winckler does not provide such a suggestion. It appears that even if the modification in the Examiner's rejection was done, there would be no suggestion or teaching for doing so and particularly no suggestion or teaching based on favorable crystallization rates. If the reason for a combination of Minnick et al in view of Winckler et al is based on favorable crystallization rates, the Examiner must show the crystallization rate of polycarbonate as compared to polyester. Then the Examiner may

be able to state that the macrocyclic polyester oligomer blended with the polymerization catalyst would be faster or have more favorable crystallization rates.

It is noted that Minnick et al is based on flame-retardant characteristics suitable for use in aircraft interiors. Winckler et al is not concerned with flame-retardant materials. Combining Minnick et al with Winckler et al would not be obvious. Moreover, it certainly would not reduce processing time and energy consumption and the rate of crystallization as suggested by the Examiner.

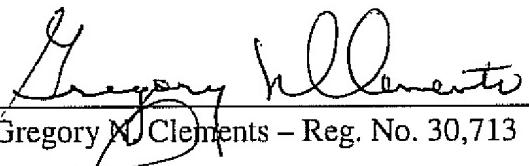
With respect to Claim 43, it is noted that there is no polyester blended with the polycarbonate in the outer layer. The flame-retardant layers must be in the outer layer of the matrix. If non-flame-retardant materials are on the outside, Minnick et al clearly teaches capping those layers with a layer of flame-retardant resin such as polyetherimide (see column 5, lines 40-42). Thus with respect to Claim 43 it seems that there will be no outer layer of a thermal plastic resin and a polymerization agent. It appears that there would be no core layer comprised of a polymerizable component and a chemically reactive component. Lastly, it seems that in the rejection of Minnick et al in view of Winckler et al there will be no lower outer layer comprised of thermoplastic resin. The same analysis can be applied to Claim 47.

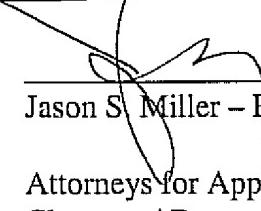
The rejection of Claims 43-54 under 35 U.S.C. 103 (a) as being unpatentable over Minnick et al in view of Winckler et al should be reversed.

**SUMMARY**

In view of the rejections against the claims of Kim in view of Winckler et al or Minnick et al in view of Winckler et al, it is submitted that these claims are patentable over the combinations of references and the rejections should be reversed.

Respectfully submitted,

  
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